



# Indra Ganesan

## COLLEGE OF ENGINEERING

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai  
Accredited by NAAC with 'B+' Grade, 2(f) & 12B Status Institution by UGC

IG Valley, Madurai Main Road, Manikandam, Tiruchirappalli - 620012

# NAAC DOCUMENTS

## QUALITY INDICATOR FRAME WORK

### CRITERION – 1

## CURRICULAR ASPECTS

SUBMITTED BY

**IQAC**

INTERNAL QUALITY ASSURANCE CELL

**INDRA GANESAN COLLEGE OF ENGINEERING**





# Indra Ganesan

**COLLEGE OF ENGINEERING**

Madurai Main Road (NH-45B), Manikandam, Tiruchirappalli - 620 012

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai  
NAAC Accredited, 2(F) Status Institution by UGC



<b>Criteria 1</b>	<b>Curricular Aspects</b>	<b>100</b>
-------------------	---------------------------	------------

## 1.1 Curricular Planning and Implementation (20)

**1.1.1 The Institution ensures effective curriculum planning and delivery through a well-planned and documented process including Academic calendar and conduct of continuous internal Assessment**

### Table of Content

S. No	Description
1.	Preface of the Course File
2.	Review of Course File
3.	Academic Schedule
4.	Faculty work load
5.	Faculty Time Table
6.	Course Plan
7.	Lecture Schedule
8.	Content Beyond Syllabus
9.	Assignment Question Paper
10.	Assignment Answer Sheet
11.	Internal Assessment Question Paper
12.	Internal Assessment Answer Key
13.	Internal Assessment Answer Book
14.	Co Based Mark Entry
15.	Audit Form

**INDRA GANESAN COLLEGE OF ENGINEERING**  
IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India  
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

**DEPARTMENT OF CIVIL ENGINEERING**

---

**PREFACE OF THE COURSE FILE**

Batch : 2018-2022

Academic Year : 2020-2021 / ODD


Program : CIVIL ENGINEERING

Year & Semester : 3<sup>rd</sup> Year / 5<sup>th</sup> Semester

Course Code : EN 8491                      NBA Course Code: C304

Name of the Course : WATER SUPPLY ENGINEERING

Faculty in-charge : K.VANISRI/AP

  
Signature of the Faculty in-charge



  
HoD / Civil

**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Man Road  
Manikandam, Trichy-620 012.

# INDRA GANESAN COLLEGE OF ENGINEERING

(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

## DEPARTMENT OF CIVIL ENGINEERING

### REVIEW OF COURSE FILE

(to be pasted on the inner side of the file-backside).(#-State Yes/No.)

S.N	Details	Date:	R-I-*	R-II-*&	R-III-*&	R-IV-*&\$	R-V-*&\$@
1.	Preface of the course file		Y				
2.	Vision, Mission, PEOs, POs, PSOs, Blooms taxonomy		Y				
3.	Subject handlers of yesteryears		Y				
4.	Timetable/Workload of the staff – Distribution of teaching load – Roles and Responsibilities		Y				
5.	Syllabus signed by staff & HoD		Y				
6.	Lecture Schedule signed by staff & HoD		Y				
7.	Course Committee meeting circular and minutes		Y				
8.	Identification of Curricular gap and Content Beyond the syllabus		Y				
9.	Self-study topics		Y				
10.	Previous AU Question papers		Y				
11.	Unit wise Q&A and Objective type questions		Y				
12.	Unit wise course material			Y	Y	Y	
13.	Assignment question paper with sample answer sheets and mark entry			Y	Y	Y	
14.	Tutorial question paper with key and mark entry			Y	Y	Y	
15.	Class test/IA test Q Paper with Key, sample answer papers and mark entry			Y	Y	Y	
16.	IA Test- result analysis-CAP-evidence-root cause analysis.			Y	Y	Y	
17.	Retest –Q paper-Attendance-marks			Y	Y	Y	
18.	AU Web portal entry sheet			Y	Y	Y	
19.	Very poor performance in first two tests-action taken.-communication to parents-evidence				Y	Y	
20.	Absence for two tests-action taken-communication to parents-evidence.				Y	Y	
21.	Indiscipline of student reported, if any						
22.	Special class/coaching class/remedial class/attendance-CAP			Y	Y	Y	
23.	Conduct of Seminar, Quizzes - proof						
24.	Content beyond the syllabus - proof						Y
25.	Student feedback on faculty						Y
26.	Course end survey						Y
27.	Internal Assessment sheet						Y
28.	AU question paper with students feedback						Y
29.	Discrepancy of the question paper and correspondence, if any						Y
30.	AU result analysis-Details of arrear students.						Y
31.	AU grade sheet						Y
32.	CO – PO & PSO attainment sheet						Y
	<b>Signature of Course handling faculty</b>		<i>A. V. Sivasay</i>	<i>A. V. Sivasay</i>	<i>A. V. Sivasay</i>	<i>A. V. Sivasay</i>	<i>A. V. Sivasay</i>
	<b>Signature of HoD</b>		<i>Sivasay</i>	<i>Sivasay</i>	<i>Sivasay</i>	<i>Sivasay</i>	<i>Sivasay</i>

Dr. G. Balakrishnan, M.E., Ph.D.,  
Principal

Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

# Indra ganesan college of engineering

Department of Civil Engineering

Work Load - Odd Semester 2020-21

S.NO.	Teacher's Name	Course Code	Course Name	Semester	Lecture / week	Total
1	Mr.S.Ramalingam (1+0)	CE 8703	Structural Design and Drawing	VII	4	4
2	Mr.R.Sivasankar (2+0)	CE8701	Estimation, costing, & Valuation Engineering	VII	4	8
		CE8302	Fluid Mechanics	III	4	
3	Mr.K.Sengottian (2+1)	CE8301	Strength of Materials-I	III	4	12
		CE8502	Structural Analysis I	V	4	
		CE8712	Design Project	VII	4	
		EN 8491	Water Supply Engineering	V	4	
4	Ms K.Vanisri	EN8591	Municipal Solid Waste Management	VII	4	12+1
		CE8501	Design of Reinforced Cement Concrete Elements	V	5	
5	Ms.G.Bharani (2+1)	CE6704	Estimation and Quantity Surveying	VII	4	13+2
		CE8511	Soil Mechanics Laboratory	V	4	
		CE6701	Railway,Airport,Harbour Engineering	VII	4	
6	Mr.K.Saravanan (2+1)	CE8591	Foundation Engineering	V	4	12+1
		CE8361	Surveying lab	III	4	
		CE8391	Construction Materials	III	4	
7	Mr.M.Kaliraj (2+1)	ORO551	Renewable Energy Sources	V	4	12
		CE8311	Construction Materials Lab	III	4	
		CE8351	Surveying	III	4	
8	Mrs.K.Gaythri (2+1)	CE8512	Water and Waste Water Analysis Laboratory	V	4	12+1
		CE8392	Engineering Geology	III	4	
9	Ms.E.Vinodha (2+1)	GE8071	Disaster Management	V	4	8+1
		CE8513	Survey Camp	V	0	

  
Time Table Co-ordinator



  
HOD

**Dr. G. Balakrishnan, M.E., Ph.D.,**

Principal

Indra Ganesan College of Engineering

Main Road

620 012.

## EN8491 WATER SUPPLY ENGINEERING

L T P C  
3 0 0 3

### OBJECTIVE:

- To equip the students with the principles and design of water treatment units and distribution system.

<b>UNIT I</b>	<b>SOURCES OF WATER</b>	<b>9</b>
Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.		
<b>UNIT II</b>	<b>CONVEYANCE FROM THE SOURCE</b>	<b>9</b>
Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.		
<b>UNIT III</b>	<b>WATER TREATMENT</b>	<b>9</b>
Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation –Clarifloccuator-Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - Residue Management – Construction, Operation and Maintenance aspects.		
<b>UNIT IV</b>	<b>ADVANCED WATER TREATMENT</b>	<b>9</b>
Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange– Membrane Systems – RO Reject Management - Iron and Manganese removal - Defluoridation - Construction and Operation & Maintenance aspects – Recent advances - MBR process.		
<b>UNIT V</b>	<b>WATER DISTRIBUTION AND SUPPLY</b>	<b>9</b>
Requirements of water distribution – Components – Selection of pipe material – Service reservoirs– Functions – Network design – Economics – Analysis of distribution networks – Computer applications – Appurtenances – Leak detection.Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.		

**TOTAL: 45 PERIODS**

**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

**OUTCOMES:**

The students completing the course will have an insight into the structure of drinking water supply systems, including water transport, treatment and distribution

- The knowledge in various unit operations and processes in water treatment
- An ability to design the various functional units in water treatment
- An understanding of water quality criteria and standards, and their relation to public health
- The ability to design and evaluate water supply project alternatives on basis of chosen criteria.

**TEXTBOOKS:**

1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.
3. Punmia, B.C., Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2014.

**REFERENCES:**

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.



**Dr. G. Balakrishnan, M.E., Ph.D.,**

Principal

Indra Ganesan College of Engineering

IG Valley, Madurai Main Road

Manikandam, Trichy-620 012.

# INDRA GANESAN COLLEGE OF ENGINEERING

IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India  
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

## DEPARTMENT OF CIVIL ENGINEERING

### Faculty Time Table

Ms K Vansiri								
Day Order	1	2	3	4	5	6	7	8
I						EN8491		
II	EN8491							
III		EN8491						
IV		EN8491						
V			EN8491					
S.Code	Title				Year / Branch		Hours	
EN 8491	Water Supply Engineering				III / Civil		5	
TOTAL - 5 hours								



**Dr. G. Balakrishnan, M.E., Ph.D.,**

Principal

Indra Ganesan College of Engineering

IG Valley, Madurai Main Road

Manikandam, Trichy-620 012.



# INDRA GANESAN COLLEGE OF ENGINEERING

IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India  
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

## DEPARTMENT OF CIVIL ENGINEERING

### Lecture Schedule

Degree/Program: **B.E / CIVIL** Course code &Name: **EN 8491 WATER SUPPLY ENGINEERING**  
Duration: 2020-2021 ODD SEM Semester: **V** Faculty: **K.VANISRI**

#### AIM:

To expose the students to principle of operation and performance of water treatment units.

#### OBJECTIVES:

- To enable the students to forecast future population, water demand and identify water sources.
- To introduce materials and methods of conveyance of water from source to city.
- To make the students familiarize about the design and operation of various conventional and advanced water treatment units.
- To impart the knowledge on design of water distribution system and the related components.

PREREQUISITES: Applied Hydraulic Engineering.

Dr. G. Balakrishnan, M.E., Ph.D.,

Principal

Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

#### COURSE OUTCOMES:

After the course, the student should be able to:

CO	Course Outcomes	POs	PSOs
C303.1	Enumerate knowledge on identification of sources and characteristics of water.	1,2,3,4,6,10,11,12	1,2
C303.2	Explain the concept in collection and conveyance of water supply system.	1,2,3,4,6,10,11,12	1,2
C303.3	Design the various functional units in water treatment.	1,2,3,4,6,10,11,12	1,2
C303.4	Design the various functional units in advanced water treatment.	1,2,3,4,6,10,11,12	1,2
C303.5	Analysis and design of distribution networks for a water supply system.	1,2,3,4,6,10,11,12	1,2
C303.6	Design and evaluate water supply project alternatives on basis of chosen criteria.	1,2,3,4,6,10,11,12	1,2

S.No	Date	Period	Topics to be Covered	Book & Page. No.
<b>UNIT-1: SOURCES OF WATER</b>				<b>Target periods :09</b>
1	12.8.2020	2	Public water supply system – Planning, Objectives,	T1
2	13.8.2020	2	Design period, Population forecasting;	T1
3	13.8.2020	2	Water demand	T1
4	14.8.2020	3	Sources of water and their characteristics	T1

5	17.8.2020	6	Surface and Groundwater	T1
6	18.8.2020	1	Impounding Reservoir	T2
7	20.8.2020	4	Development and selection of source	T1
8	21.8.2020	3	Source Water quality – Characterization	T1
9	24.8.2020	6	Drinking Water quality standards	R2
<b>UNIT-2: CONVEYANCE FROM THE SOURCE</b>				<b>Target periods :09</b>
10	25.8.2020	6	Water supply – intake structures	T1,R1
11	26.8.2020	1	Functions; Pipes and conduits for water	T1
12	31.8.2020	6	Pipe materials	T1
13	1.9.2020	1	Hydraulics of flow in pipes	T1
14	3.9.2020	2	Transmission main design	T2
15	4.9.2020	2	Laying, jointing and testing of pipes	T1
16	5.9.2020	3	Pipe appurtenances	R1
17	7.9.2020	6	Types and capacity of pumps	T2
18	7.9.2020	6	Selection of pumps and pipe materials	T1
<b>UNIT III - WATER TREATMENT</b>				<b>Target Periods :09</b>
19	8.9.2020	1	Objectives – Unit operations and processes	T3
20	9.9.2020	2	Principles, functions, and design of water treatment plant units	T1
21	14.9.2020	6	Aerators of flash mixers	T1
22	15.9.2020	1	Coagulation and flocculation	R1
23	17.9.2020	2	Clarifloccuator-Plate and tube settlers	T1
24	18.9.2020	2	Pulsator clarifier - sand filters	T1
25	19.9.2020	3	Disinfection	T1
26	21.9.2020	6	Residue Management	R2
27	22.9.2020	1	Construction, Operation and Maintenance aspects.	T1
<b>UNIT IV - ADVANCED WATER TREATMENT</b>				<b>Target Periods :09</b>
28	25.9.2020	2	Water softening	T1
29	5.10.2020	2	Desalination	T1
30	6.10.2020	3	R.O. Plant	R1
31	8.10.2020	6	Demineralization	T1
32	9.10.2020	1	Adsorption - Ion exchange	T1
33	10.10.2020	2	Membrane Systems	T1
34	12.10.2020	2	RO Reject Management	R1
35	13.10.2020	3	Iron and Manganese removal	T1
36	14.10.2020	6	Defluoridation - Construction and Operation & Maintenance aspects	T1
<b>UNIT V - WATER DISTRIBUTION AND SUPPLY</b>				<b>Target Periods:09</b>
37	15.10.2020	1	Requirements of water distribution	T1
38	16.10.2020	2	Components – Selection of pipe material	T2
39	17.10.2020	2	Service reservoirs – Functions	T1
40	19.10.2020	6	Network design – Economics	T1
41	20.10.2020	1	Analysis of distribution networks -Computer applications	T2
42	21.10.2020	2	Principles of design of water supply in buildings	T1
43	22.10.2020	2	House service connection – Fixtures and fittings,	T1

Dr. G. Balakrishnan, M.E., Ph.D.,  
 Principal  
 Indra Ganesan College of Engineering  
 IG Valley, Madurai Main Road  
 Manikandam, Trichy-620 012.

Date : 06.08.2020

**CENTRE FOR ACADEMIC COURSES**  
ANNA UNIVERSITY: : CHENNAI - 600 025

**ACADEMIC SCHEDULE FOR NON AUTONOMOUS AFFILIATED COLLEGES**

**August 2020 - November 2020 (ODD SEMESTER - Except I Semester)**

UG & PG Programmes

Sl. No.	Programme	Commencement of Classes	Last working day	Commencement of Practical Examinations	Commencement of End Semester Examinations
1.	All UG/PG Programmes (except I Semester)	12.08.2020	26.10.2020**	28.10.2020	09.11.2020
2.	B.E. / B. Tech. (Part-Time) - III, V, VII				

**NOTE:**  
**RE - OPENING DAY FOR THE NEXT SEMESTER: 14.12.2020 (Monday)**

1. The Theory and Practical Examination schedules which will be published in due course by the Controller of Examinations, Anna University, Chennai should be followed. (Practical Examinations will be conducted before the theory examinations).
2. Assessment Schedule for the August 2020 - November 2020 should be followed strictly.
3. Saturdays included in the Assessment period shall be used for conducting the Assessment Tests.

\*\* In order to ensure minimum no. of working days, the following Saturdays are declared as working days.

Sl. No.	Working Days (Saturdays for UG & PG)	Time Table of the Week Day to be Followed
1.	05.09.2020	Tuesday
2.	12.09.2020	Friday
3.	19.09.2020	Monday
4.	26.09.2020	Tuesday

Sl. No.	Working Days (Saturdays for UG & PG)	Time Table of the Week Day to be Followed
5.	03.10.2020	Wednesday
6.	10.10.2020	Thursday
7.	17.10.2020	Friday
8.	24.10.2020	Monday

**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal

Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

**DIRECTOR**  
**ACADEMIC COURSES**

DAC - SB

44	23.10.2020	3	Systems of plumbing	R2
45	24.10.2020	2	Types of plumbing.	R1
<b>Content Beyond the Syllabus</b>				
46	02.11.2020	4	Seawater reverse Osmosis	Material
47	03.11.2020	3	Advanced water treatment	Material

### Book Reference - Text Books

Sl.	Title of the Book	Author	Publisher	Year
1.	Environmental Engineering	Garg, S.K	Khanna Publishers, New Delhi	2010.
2.	Water Supply Engineering	Modi, P.N.	Standard Book House, New Delhi	2010.
3	Water Supply Engineering	Punmia B.C , Asoke Jain and Arun Jain	Laxmi Publications, New Delhi	2014


### Book Reference – References

Sl	Title of the Book	Author	Publisher	Year
1.	Manual on Water Supply and Treatment	CPHEEO	Ministry of Urban Development, Government of India, New Delhi	1997.
2.	Water Works Engineering Planning.	Syed R. Qasim and Edward M. Motley Guang Zhu	Mcgraw-Hill College; International Edition,	1995

### Website Reference:

<http://nptel.iitm.ac.in/courses.php?branch=Environmental Engineering>  
[www.freebookspot.com](http://www.freebookspot.com)

  
Signature of the Faculty in-charge

  
HoD / Civil

  
Dr. G. Balakrishnan, M.E., Ph.D.,  
Principal

Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

# INDRA GANESAN COLLEGE OF ENGINEERING

IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India  
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

## DEPARTMENT OF CIVIL ENGINEERING

### Identification of Curricular Gap & Content Beyond Syllabus(CBS)

Name of the Faculty :K.Vanisri Course Code & Name: EN 8491 Water Supply Engineering

Degree & Program:B.E. /CIVIL Semester & Section: V/A Academic Year: 2020 -2021 /ODD

#### I. Mapping of Course Outcomes with POs & PSOs.( before CBS)

Table.1 Mapping of COs, C, PSOs with POs - before CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C210.1	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210.2	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210.3	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210.4	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210.5	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210.6	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210	3	3	3	2	-	2	3	-	-	2	1	1	2	2

#### II. Identification of content beyond syllabus.

Table.2 Identification of content beyond syllabus

Details of Content Beyond Syllabus(CBS) added	POs strengthened/ vacant filled	CO/Unit
Seawater treatment –Reverse Osmosis.	PO5	C210.4

#### III. Mapping of Course Outcomes with POs & PSOs. (After CBS)

Table.3 Mapping of COs, C, PSOs with POs- after CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C210.1	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210.2	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210.3	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210.4	3	3	3	2	2	2	3	-	-	2	1	1	2	2
C210.5	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210.6	3	3	3	2	-	2	3	-	-	2	1	1	2	2
C210	3	3	3	2	2	2	3	-	-	2	1	1	2	2

Signature of the Faculty

Dr. G. Balakrishnan, M.E., Ph.D.,  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Maaurai Main Road  
Manikandam, Trichy-620 012

H&D/Civil

**INDRA GANESAN COLLEGE OF ENGINEERING**  
IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India  
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

**DEPARTMENT OF CIVIL ENGINEERING**

---

**CBS PROOF**

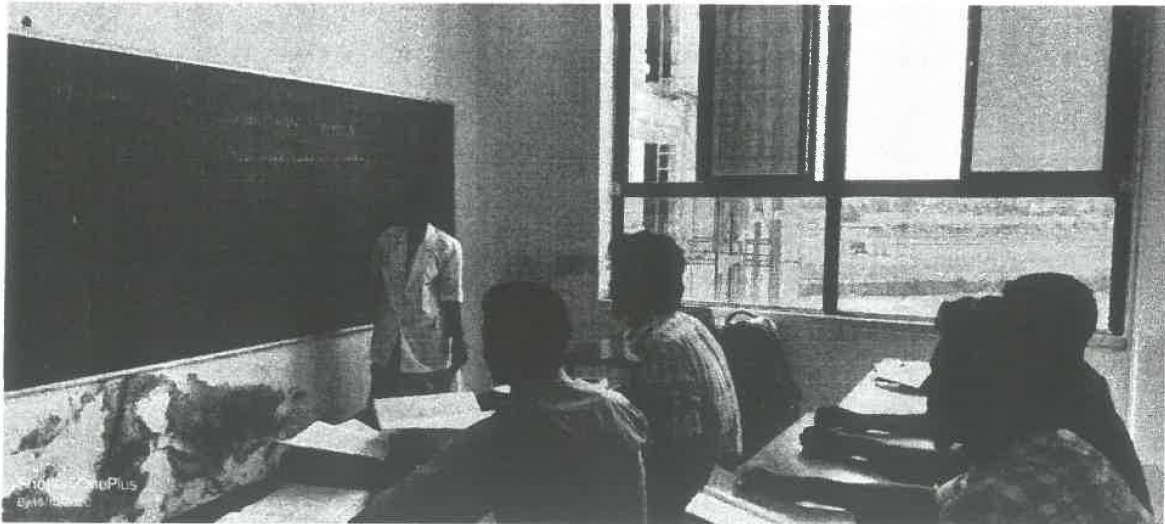
**Academic year : 2020-2021 ODD**

**Regulation : 2017**

**YEAR/Sem : III/V**

**Name of the Faculty : K.Vansiri/AP**

**Topic: Seawater Treatment-Reverse Osmosis**



**Dr. G. Balakrishnan, M.E., Ph.D.**

Principal

Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

# Characteristics of Seawater

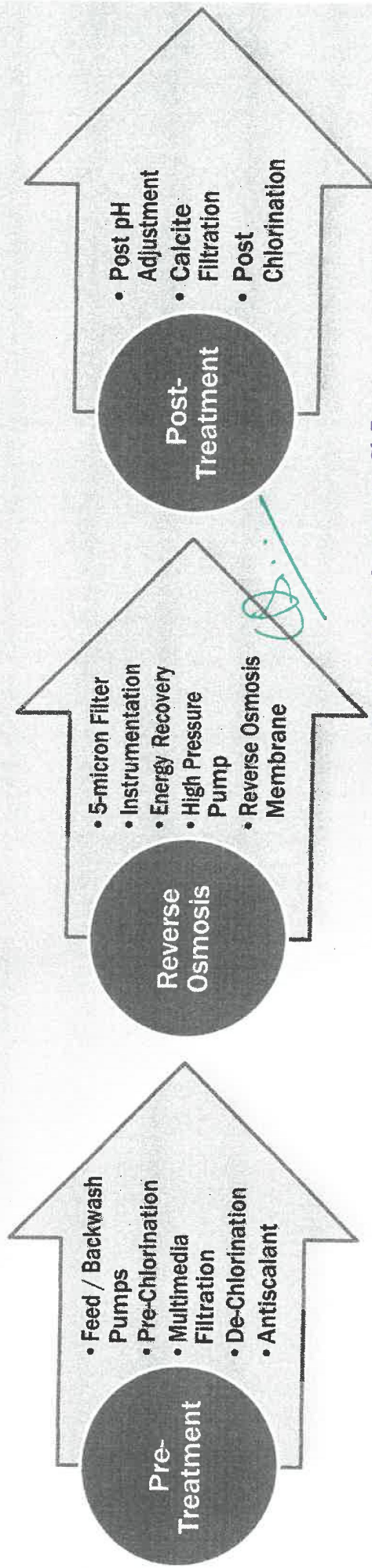
- Total Dissolved Solids: 30,000 mg/L to 45,000 mg/L
- Total Suspended Solids: 50 mg/L to 250 mg/L
- pH: 7 - 8
- Microorganisms & Bacteria
- Small amount of heavy metals



**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandan, Trichy-620 012.



# Seawater Reverse Osmosis



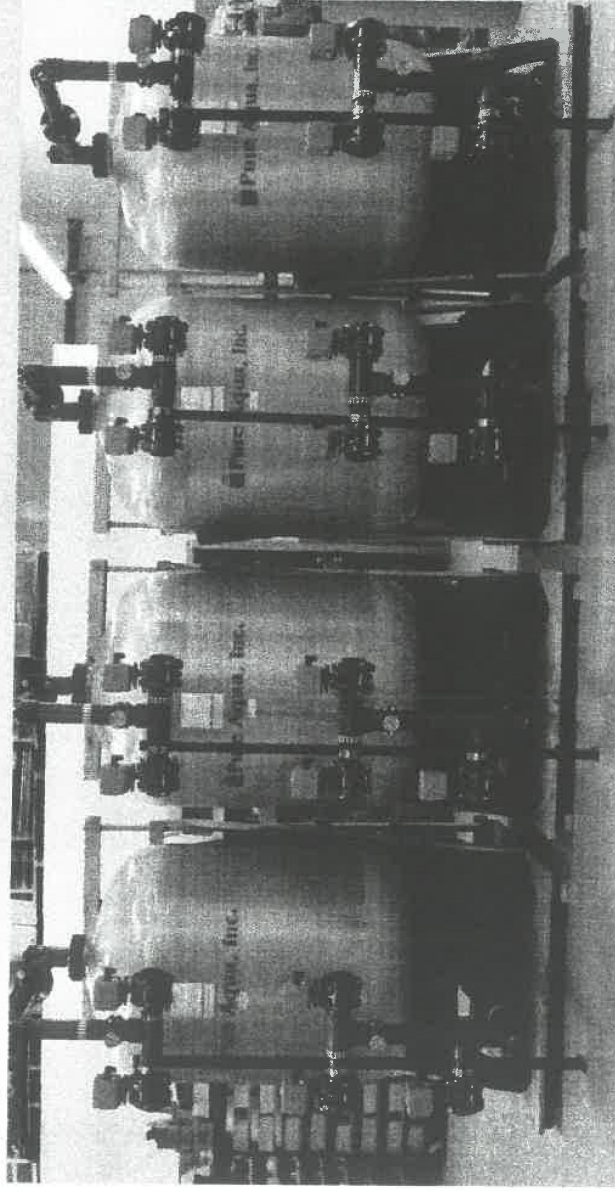
**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal

Indra Ganesan College of Engineering  
IG Valley, Medurai Main Road  
Manikandam, Trichy-620 012.

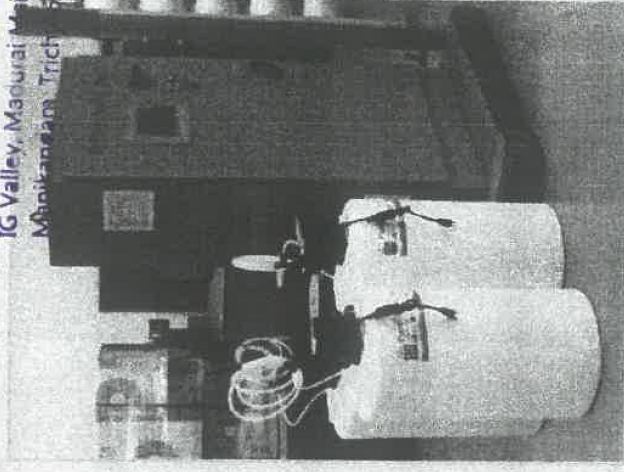


# Pre & Post Treatment Options Available

**Media Filtration with Automatic Backwashing  
Chemical Dosing Treatments and UV Sanitization**



**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Mankandam, Trichy - 620 012.



8

# INDRA GANESAN COLLEGE OF ENGINEERING

IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India  
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

## DEPARTMENT OF CIVIL ENGINEERING

### Assignment Question Paper

Assignment – 01		Date of Issue:	07.09.2020	Marks	10
Course code	EN8491	Course Title	Water Supply Engineering		
Year	III	Semester/Section	V	Date of Submission:	09.09.2020

Q.No	Questions	CO
1	Explain the characteristics of water in detail.	CO304.1
2	Illustrate the different types of Joints	CO304.2

Name and Signature of the Faculty Incharge

(K. VANISRI)

  
HoD/Civil



**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

**INDRA GANESAN COLLEGE OF ENGINEERING**  
IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India  
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

**DEPARTMENT OF CIVIL ENGINEERING**

**Assignment Answer Sheet**

Name of the Student : M Mahendran

AU Register Number: 811218103002

Assignment – 01		Date of Issue:	07.09.2020	Marks
Course code	EN 8491	Course Title	Water Supply Engineering	
Year	III	Semester/Section	V	Date of Submission: 09.09.2020

Q.No	Questions	CO
1	Explain the characteristics of water in detail.	C303.1
2	Illustrate the different types of Joints	C303.2

**Mark Allocation**

Rubrics	Marks Allocated	Marks obtained
Content Quality	6	5
Presentation Quality	2	1
Timely submission	2	2
Total marks	10	<u>8</u>

Name and Signature of the Faculty Incharge

(K. Vanisri / AP)

*K. Vanisri* 9/9/2020

*[Signature]*

*[Signature]*  
HoD/Civil

**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal

Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.



# INDRA GANESAN COLLEGE OF ENGINEERING

IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India  
(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

<b>Internal Assessment Exam - I</b>			<b>Date/Session</b>	<b>11.09.2023 &amp; FN</b>	<b>Marks</b>	<b>50</b>
<b>Course code</b>	<b>EN 8491</b>	<b>Course Title</b>	<b>Water Supply Engineering</b>			
<b>Regulation</b>	<b>2017</b>	<b>Duration</b>	<b>90 minutes</b>	<b>Academic Year</b>	<b>2020-2021</b>	
<b>Year</b>	<b>III</b>	<b>Semester</b>	<b>V</b>	<b>Department</b>	<b>Civil</b>	
<b>COURSE OUTCOMES</b>						
<b>CO1:303.1</b>	Enumerate knowledge on identification of sources and characteristics of water.					
<b>CO2:303.2</b>	Explain the concept in collection and conveyance of water supply system.					
<b>CO3:303.3</b>	Design the various functional units in water treatment.					
<b>CO4:303.4</b>	Design the various functional units in advanced water treatment.					
<b>CO5:303.5</b>	Analysis and design of distribution networks for a water supply system.					
<b>CO6:303.6</b>	Design and evaluate water supply project alternatives on basis of chosen criteria.					

Q.No.	Question	CO	BTS												
<b>PART A</b>															
<b>(Answer all the Questions 10 x 2 = 20 Marks)</b>															
1	List the objectives of the water supply system.	C303.1	K1												
2	Enumerate the components of a water supply scheme.	C303.1	K1												
3	Define “Design Period”.	C303.1	K1												
4	What is water demand? State its types.	C303.1	K1												
5	Define Per Capita Demand.	C303.1	K2												
6	What is intake?	C303.2	K1												
7	How to estimate storm runoff?	C303.2	K4												
8	What are the sources of wastewater from a community?	C303.2	K1												
9	List the factors governing the selection of a particular source of water?	C303.2	K2												
10	Differentiate between rainfall and runoff.	C303.2	K2												
<b>PART B</b>															
<b>(Answer all the Questions 2 x 10 = 20 Marks)</b>															
11a	The population of 5 decades from 1930 to 1970 are given below .Find out the population after one, two and three decades beyond the last known decade by arithmetic increase and geometric increase method.	C303.1	K3												
	<table border="1" style="width: 100%; border-collapse: collapse; margin: 0 auto;"> <tr> <td style="padding: 2px;">Year</td> <td style="padding: 2px;">1930</td> <td style="padding: 2px;">1940</td> <td style="padding: 2px;">1950</td> <td style="padding: 2px;">1960</td> <td style="padding: 2px;">1970</td> </tr> <tr> <td style="padding: 2px;">Population</td> <td style="padding: 2px;">25000</td> <td style="padding: 2px;">28000</td> <td style="padding: 2px;">34000</td> <td style="padding: 2px;">42000</td> <td style="padding: 2px;">47000</td> </tr> </table>	Year	1930	1940	1950	1960	1970	Population	25000	28000	34000	42000	47000		
Year	1930	1940	1950	1960	1970										
Population	25000	28000	34000	42000	47000										
OR															
11b	In two periods of each 20 years a city has grown from 30000 to 170000 and then 300000. Determine the saturation population.	C303.1	K3												
12a	Explain about river intake structures with neat sketch?	C303.2	K2												
OR															
12b	Explain about type of joints in pipes.	C303.2	K2												
<b>PART C</b>															
<b>(Answer all the Questions 1 x 10 = 10 Marks)</b>															
13a	Discuss the physical, chemical and biological characteristics of water.	C303.1	K2												
OR															
13b	Explain about various types of pipes and its advantages and disadvantages?	C303.2	K1												

*M.V.M.*  
Course Faculty  
(Name /Sign / Date)

*(Signature)*  
**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

*(Signature)*  
HoD  
(Name /Sign / Date)

Register Number: 

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



# INDRA GANESAN COLLEGE OF ENGINEERING

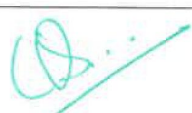
IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India

(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

Internal Assessment Exam – I Answer Key			Date/Session	11.09.2020 FN	Marks	50
Course code	EN 8491	Course Title	Water Supply Engineering			
Regulation	2017	Duration	90 minutes	Academic Year	2020-2021	
Year	III	Semester	V	Department	Civil	

## COURSE OUTCOMES

CO1:303.1	Enumerate knowledge on identification of sources and characteristics of water.
CO2:303.2	Explain the concept in collection and conveyance of water supply system.
CO3:303.3	Design the various functional units in water treatment.
CO4:303.4	Design the various functional units in advanced water treatment.
CO5:303.5	Analysis and design of distribution networks for a water supply system.
CO6:303.6	Design and evaluate water supply project alternatives on basis of chosen criteria.

Q.No.	Question
<b>PART A</b> (Answer all the Questions 10 x 2 = 20 Marks)	
1	<p>List the objectives of the water supply system.</p> <p>The main objective of water supply system is to provide portable water to the various sections of community in accordance with their demand and requirement.</p> <ol style="list-style-type: none"><li>It should ensure a constant and reliable water supply to the people.</li><li>It should help in supplying safe wholesome water to the people thereby promoting better health</li></ol>
2	<p>What are the methods of population forecasting?</p> <ol style="list-style-type: none"><li>Arithmetic increase method</li><li>Geometric increase method</li><li>Method of varying increment (or) Incremental increase method</li><li>Decreasing rate of growth method</li><li>Simple graphical method</li><li>Comparative graphical method</li></ol>
3	<p>Define “Design Period”.</p> <p>The future period for which a provision is made in the water supply scheme is known as design period.</p>
4	<p>What is water demand? State its types.</p> <ol style="list-style-type: none"><li>Domestic water demand</li><li>Industrial</li><li>Institution and commercial</li><li>Demand for public use</li><li>Fire demands</li></ol> <p style="text-align: right;"> Dr. G. Balakrishnan, M.E., Ph.D., Principal Indra Ganesan College of Engineering IG Valley, Madurai Main Road Manikandam, Trichy-620 012.</p>
5	<p>Define wholesome water</p> <p>Wholesome water is defined as the water which containing minerals in small quantities and free from harmful</p>

	chemical impurities. It should be free from bacteria and should be colourless, tasty and odour free.
6	<p>What is intake structures?</p> <p>Intakes are the structures used for admitting water from the surface source and conveying it further to the treatment plant. It is a masonry or concrete structure with an aim of providing relatively clean water, free from pollution, sand and objectionable floating material.</p>
7	<p>How to estimate storm runoff?</p> <p>(i) Inglis formula  (ii) Khosla's formula  (iii) Justin's formula  (iv) Vermule's formula  (v) Run-off co-efficient formula.</p>
8	<p>What are the sources of wastewater from a community?</p> <p>Surface water:</p> <p>(vi) Rivers  (vii) Lakes  (viii) Impounding reservoirs</p> <p>Ground waters:</p> <p>(i) Springs  (ii) Infiltration galleries  (iii) Wells</p>
9	<p>List the factors governing the selection of a particular source of water?</p> <p>(i) The quantity of available water  (ii) The quality of available water  (iii) Distance of the source of supply  (iv) General topography of the intervening area</p>
10	<p>Differentiate between rainfall and runoff</p> <p>Run off is the portion which flows over the surface of ground as storm water or flood flow to appear in the form of stream.</p> <p>Rainfall results from precipitation which are measured as the vertical depth of water that would accumulate on a level surface.</p>

**PART B**

(Answer all the Questions 2 x 10 = 20 Marks)

11a The population of 5 decades from 1930 to 1970 are given below .Find out the population after one, two a three decades beyond the last known decade by arithmetic increase and geometric increase method.

Year	1930	1940	1950	1960	1970
Population	25000	28000	34000	42000	47000

Arithmetic Increase Method:

P1=54200  
P2=63500  
P3= 72420

Geometric Increase Method:

P1=58400



**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

P2=66000  
P3= 75400

OR

11b In two periods of each 20 years a city has grown from 30000 to 170000 and then 300000. Determine the saturation population.

Ans: Population Saturation= 342600

12a Explain about river intake structures with neat sketch?

RIVER INTAKE:

Water from the rivers is always drawn from the upstream side, because it is free from the contamination caused by the disposal of sewage in it. It is a circular masonry tower of 4 to 7 m in diameter constructed along the bank of the river at such a place from where the required quantity of water can be obtained even in the dry period. The water enters in the lower portion of the intake known as sump well from penstocks.

OR

12b Explain about type of joints in pipes.

- (i) Spigot and socket joint.
- (ii) Expansion joint
- (iii) Flanged joint
- (iv) Screwed joint.
- (v) Collar joint.
- (vi) Flexible joint. SPIGOT

AND SOCKET JOINT

Sometimes this is called bell and spigot joint. This type of joint is mostly used for cast iron pipes. For the construction of this joint the spigot or normal end of one pipe is slipped in the socket or bell end of the other pipe until contact is made at the base of the bell. After this a yarn of hemp is wrapped around the spigot end of the pipe and is tightly filled in the joint by means of yarning iron upto 5 cm depth. The hemp is tightly packed to maintain a regular annular space and for preventing jointing material from falling inside the pipe.

**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

PART C

(Answer all the Questions 1 x 10 = 10 Marks)

13a Discuss the physical, chemical and biological characteristics of water.

Characteristics of water are physical, chemical and bacteriological which define water quality.

# INDRA GANESAN COLLEGE OF ENGINEERING

IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 622 012, India

(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

## Internal Assessment Test Answer Book

Name	S. MUSARAF ALI	Year/ Semester/Section	II
Batch No.	Date/Session	11.9.2020	Department
			CIVIL
Course code	EN 8491	Course Title	WATER SUPPLY ENGG
Internal Assessment Test	IAT 1 <input checked="" type="checkbox"/>	IAT 2 <input type="checkbox"/>	IAT 3 <input type="checkbox"/> Model <input type="checkbox"/>
Name and Signature of the Invigilator with date		K. Saravanan/AP. 11/9	

Instruction to the Student: Put tick mark to the question attended in the column against question.

Part A			Part B / Part C				Total Marks
Q. No.	✓	Marks	Q. NO.	✓	a	b	
					Marks	Marks	
1		2	11		8		8
2		2	12			6	6
3		2	13		7		7
4		1	14				
5		2	15				
6		2	16				
7		1				<b>Total</b>	<b>24</b>
8		2	<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-size: 24px;">41/50</span> </div>			<div style="text-align: center;"> <p>Name and Signature of the Examiner with date</p> </div>	
9		2					
10		1					
<b>Total</b>		<b>17</b>	<b>Grand Total</b>				

**Dr. G. Balakrishnan, M.E., Ph.D.**  
 Principal  
 Indra Ganesan College of Engineering  
 IG Valley, Madurai Main Road  
 Manikandam, Trichy-620 012.

M. V. V. V.  
 13/9/2020

To be filled by the examiner							
Course Outcomes	1	2	3	4	5	6	Total
Marks allotted							
Marks Obtained							
IQAC Audit - Remarks							
							<p>Name and Signature of the IQAC member</p>



**Physical Characteristics**

- Turbidity
- Colour
- Taste and Odour
- Temperature

**Chemical Characteristics:**

- pH (Power or Percentage of Hydrogen)
- Acidity
- Alkalinity
- Hardness
- Chlorides
- Sulphates
- Iron
- Solids
- Nitrates

**Bacteriological Characteristics:**

**Tests to indentify bacteria**

- Standard plate count test
- Most probable number
- Membrane filter technique

**Dr. G. Balakrishnan, M.E., Ph.D.**

Principal

Indra Ganesan College of Engineering

IG Valley, Madurai Main Road

Manikandan, Trichy-620 012.

OR

13b Explain about various types of pipes and its advantages and disadvantages?

1. Cast iron
2. Wrought iron
3. Steel
4. Galvanized iron
5. Cement concrete
6. Asbestos cement
7. Plastic
8. Copper
9. Lead

Course Faculty

(Name /Sign / Date)

HoD

(Name /Sign / Date)



**INDRA GANESAN COLLEGE OF ENGINEERING**  
**IG VALLEY, MANIDANDAM, TIRUCHIRAPPALLI – 620 012**  
**DEPARTMENT OF CIVIL ENGINEERING**  
**ACADEMIC YEAR 2020 – 2021 (ODD SEMESTER)**  
**STUDENTS MARK STATEMENT- CO BASED**  
**CYCLE TEST-I**

**SUBJECT CODE & TITLE: EN 8491 WATER SUPPLY ENGINEERING**

**YEAR/SEM: III/V**

**MONTH & YEAR: SEP,2020**

S.NO	REG NO	STUDENT NAME	COX (Y)	COX (Y)	TOTAL (50)	TOTAL (100)
1.	811218103001	Akash J	20	19	39	78
2.	811218103002	Mahendran M	25	19	44	88
3.	811218103003	Musarf Ali S	24	17	41	82
4.	811218103004	Prabu JJ	17	15	32	64

**MARKS RANGE:**


<20	20-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
-	-	-	-	-	1	1	2	-

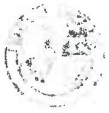
Total No.of Candidates Present	04
Total No.of Candidates Absent	Nil
Total No.of Students Pass	04
Total No. of Students Fail	0
Percentage of Pass	100%

  
STAFF INCHARGE

  
HoD/CIVIL

  
PRINCIPAL

  
**Dr. G. Balakrishnan, M.E., Ph.D.,**  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Manidandam Main Road  
Manidandam, Tiruchy-620 012.



# INDRA GANESAN COLLEGE OF ENGINEERING

IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu - 620 012, India  
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

## IQAC Academic Audit Form

ACADEMIC YEAR: 2020-21 ODD SEMESTER-V

Name of Department : CIVIL Year / Sem / Sec : III / V No. of Students Registered 04

Details of Examination : IA Test -I

S.No.	Course Code	List of Reg.No Verified	Course Log Book Verified (Y/N)	Course File Verified (Y/N)	No of students Attended	No of Absentees	No of Failures	Pass %	Remarks
1.	EN8991	811218103001 811218103004	Y	Y	04	-	-	100%	

Verified by

External Member Name and Signature:

Internal Member Name and Signature:

G. Basani

Overall Remarks:

Jr. G. Balakrishnan, M.E., Ph.D.,  
Principal  
Indra Ganesan College of Engineering  
IG Valley, Madurai Main Road  
Manikandam, Trichy-620 012.

HOD/CIVIL

IQAC Co-ordinator

Principal